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BRIEF COMMUNICATION

Manipulating lamb birth weight and survival rate in singletons born to hoggets

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INTRODUCTION

Lambs born to hoggets tend to be relatively lightweight at birth (Drymundsson, 1973; McMillan & McDonald, 1983) and display low survival rates to weaning (McCall & Hight 1981; McMillan & McDonald, 1983). In addition the incidence of singletons in hoggets often exceeds 92% (McCall & Hight, 1981; McMillan & McDonald, 1983). Therefore management procedures that improve both birth weight and survival of singleton lambs should have a significant effect on returns.

Severe under nutrition during pregnancy of mature ewes can lead to reduced ewe and lamb performance (Rattray 1986), which can negatively affect lamb survival. However to date minimal research under New Zealand's pastoral conditions has been undertaken in hoggets. In contrast to the mature ewe, it is also advantageous for the hogget to be increasing in conceptus-free live weight during pregnancy if lifetime performance is not to be negatively affected. Interestingly, under concentrate feeding regimes in the United Kingdom it has been reported that a high level of hogget nutrition in pregnancy, actually reduces both lamb birth weight and survival (Wallace *et al*., 1996).

Shearing mature ewes in mid- to late-pregnancy has been shown to differentially increase singleton- (Morris et al., 2000; Kenyon et al., 2002a) and twin-lamb birth weights (Morris & McCutcheon, 1997; Morris et al., 1999; Kenyon et al., 2002b). Mid-pregnancy shearing has tended to increase twin-lamb survival rates (Morris et al., 1999; Kenyon et al., 2002b) but has been found to decrease singleton survival rates in one of four studies (Kenyon 2002). The effect of mid- to late-pregnancy shearing of hoggets has not been examined under pastoral conditions in New Zealand. Due to the low rate of twin pregnancies in hogget's the chance of achieving a positive affect from mid-pregnancy shearing on both a lamb birth weight and survival may be low.

The aims of these studies were to determine if hogget live weight change and shearing treatment during pregnancy could be used to manipulate singleton lamb birth weight and survival.

MATERIALS AND METHODS

Study one: Four-hundred and two Romney hoggets were mated to Perendale rams for a 28-day mating period. Hoggets were pregnancy scanned, via ultrasound scanning 79 days after the mid-point of mating (P79). Hoggets were either shorn during mid-pregnancy (P79), shorn in late pregnancy (P119) or left unshorn (with approximately 6 month's wool growth). Hoggets were managed as one group throughout pregnancy until set-stocking at P130. Hoggets were then randomly allocated to lambing paddocks for the lactation period. Hoggets were managed under commercial conditions throughout the study. Data from 230 singleton bearing hoggets and their lambs only, are discussed in this paper.

Study two: Three hundred and forty-three Romney and Coopworth hoggets (169 and 174 respectively) were synchronised via a CIDR and mated to Perendale rams during a 23-day period (P1 = mid-point of the total mating period). At P13, hoggets were stratified by breed and live weight and randomly allocated to one of three nutritional treatments. During the period P13 to 24-36 hours after parturition (L1) a third of the hoggets were managed with the aim of increasing total live weight by 10 kg ('low' group), a third with a target increase of 20 kg ('medium' group) and the remainder with a target of 30 kg ('high' group). All hoggets were weighed fortnightly to monitor progress in achieving live weight targets. After each weighing, pasture allowances were adjusted to ensure target live weight gains were met. Twenty-four to 36 hours after parturition the ewes and their lambs were randomly allocated to paddocks for the lactational period. Data from 206 singleton-bearing Romney and Coopworth hoggets (n = 112 and 94 respectively) and their lambs are presented in this paper.

In both studies lambs were identified to the dam, sexed, weighed, and tagged within 24 hours of birth regardless of category (dead vs alive). Lambs were weighed at L55 and L46 for study one and two respectively and each lamb's status (present vs absent) was established as a measure of lamb survival rate.

Data analysis

All measurements on hoggets and lambs were subjected to analysis of variance 'Genstat' (Genstat, 2002) unless otherwise stated. In study one, the only effect tested was dam shearing treatment. In study two, the main effects of hogget breed and nutritional treatment and their interaction were included in the original models. Non-significant (P>0.05) interactions were then removed and the models re-fitted.

In study one and two sex of lamb was used as a fixed effect in the models used to partition variation in lamb birth weight and L55 and L46 weight.

Lambs survival was analysed as a binomial trait using the SAS (SAS, 1985) procedure for categorical data modelling (CATMOD).

RESULTS

Study one: There was a significant effect of shearing treatment on lamb birth weight such that lambs born to hoggets shorn in mid-pregnancy were significantly (P<0.05) heavier than their counterparts born to unshorn and late-pregnancy shorn hoggets (Table 1). Mid- and late-pregnancy shearing tended to increase lamb survival but not significantly so.

Study two: The nutritional treatments were successful at achieving target differences in total hogget live weight (Table 2). There were significant (P<0.05) interactions between hogget nutrition and breed type at both P-13 and P130. At P-13 when the nutritional treatments were established, both the 'low' and 'high' group Romney hoggets were significantly (P<0.05) heavier than the Coopworth hoggets. At P130 'low' group Romneys were significantly (P<0.05) lighter than their Coopworth counterparts. No such difference existed between 'medium' and 'high' group hoggets.

However, the absolute differences between breeds were minor at both P-13 and P130. Neither dam breed nor nutrition treatment had any affect on lamb birth weight. Lambs born to 'low' hoggets were significantly (P<0.05) lighter at L46 than lambs born to either 'medium' or 'high' hoggets. Hogget nutritional treatment had no affect on lamb survival rate.

DISCUSSION

Shearing in mid-pregnancy increased singleton lamb birth weights while late-pregnancy shearing did not. In a study in which a birth weight effect was found in twin-born lambs only, Morris & McCutcheon (1997) suggested that shearing of mature ewes during mid-pregnancy has a greater chance of affecting placental development, and thus birth weight, than shearing in late pregnancy. In contrast to the findings of the present study, Adalsteinsson (1972) in Iceland, reported that late-pregnancy shearing of hoggets increased lamb birth weight. However, in that study the exact stage of pregnancy in which shearing was under-taken was not stated.

Mid-pregnancy shearing of mature ewes has tended to increase survival rates to weaning of twin lambs (Morris *et al*., 1999; Kenyon *et al*., 2002b). In addition, late-pregnancy shearing of mature ewes has also been associated with increased survival of newborn lambs (Wodzicka-Tomaszewska, 1963). In the present study shearing hoggets during pregnancy tended to increase survival although not significantly.

In the mature singleton-bearing ewe the average gravid uterus weight at term is 8.5 kg (Rattray, 1986). Therefore, in the singleton-bearing, growing hogget, any treatment which does not allow total live weight gain to be significantly greater than 8.5 kg, could be regarded as a form of under nutrition as the hogget needs to be gaining conceptus free live weight if both two-tooth and mature live weight are not to be impaired. Therefore a level of nutrition during pregnancy that allows for both adequate foetal and hogget growth is required. However, a very high level of feeding under a concentrate regimen has been shown to negatively affect both lamb birth weight and survival (Wallace *et al*., 1996). In the present study dam nutritional treatment had no affect on either lamb birth weight or survival. The total live weight change of 'high' treatment hoggets in the present study was only slightly lower (195 vs. 234g/d) than that reported by Wallace *et al*. (1996). It is possible that the approximately 9 kg difference in mating weights or the slightly lower live weight gains between studies impacted on the lamb results. Under New Zealand's pastoral farming systems it is unlikely that changes in hogget total live weight during pregnancy would be significantly greater than that observed in the present study. The 'low' treatment in the present study was designed to allow for expected conceptus growth and a small increase in conceptus free hogget live weight. The total live weight increase of 'low' group ewes was approximately 12 kg. Therefore the present results suggest that under pastoral feeding conditions there is no advantage in terms of lamb birth weight or survival, of offering hoggets a level of nutrition in which total weight in pregnancy increases significantly above expected conceptus growth. However, at the 'low' levels in the present study lamb growth was impaired. This impairment may in some part be due to the relatively low weights at mating. At a heavier mating weight it is possible that this affect may not be present.

CONCLUSION

The aim of this study was to examine the affects of hogget live weight change and shearing treatments during pregnancy on both lamb birth weight and survival. A total hogget live weight change during pregnancy slightly above expected conceptus weight, failed to negatively affect either lamb birth weight or lamb survival in comparison to treatments, which resulted in even greater live weight changes. However lamb growth to L46 was impaired. The

TABLE 1: Effect of dam shearing treatment on hogget live weight (kg) in pregnancy and lamb birth weight (L1) and L55 weight (kg) and survival (%) rate (Mean ±SEM). Means within treatments with differing letter superscripts are significantly (P<0.05) different.

		Hogget live weight				Lamb						
		P-13		P115[1]		L1			L 55 weight		Survival (%)	
	n	Mean	±SE	Mean	±SE	Mean	±SE	n	Mean	±SE	Mean	±SE
Unshorn	76	37.97	0.33	51.03	0.42	4.77[a]	0.09	54	20.81	0.36	0.90[2]	0.25 (71.1)[3]
P79 shorn	74	37.78	0.33	50.03	0.42	5.08[b]	0.09	56	21.15	0.35	1.13	0.27 (75.7)
P119 shorn	80	38.29	0.32	49.84	0.41	4.72[a]	0.09	64	20.21	0.33	1.38	0.27 (80.0)

[1] Corrected for removal of fleece weight
[2] Logit-transformed
[3] Back-transformed (%)

TABLE 2: Effect of dam nutritional treatment and breed on hogget live weight (kg) in pregnancy and lamb birth weight (L1) and L46 weight (kg) and survival (%) rate (Mean ±SEM). Means within treatments with differing letter superscripts are significantly (P<0.05) different.

		Hogget live weight				Lamb						
		P-13		P130		L1			L46		Survival (%)	
	n	Mean	±SE	Mean	±SE	Mean	±SE	n	Mean	±SE	Mean	±SE
Breed												
Romney	112	36.80[b]	0.35	56.39[b]	0.42	4.31	0.08	94	16.15	0.35	1.65[2]	0.26 (83.9)[3]
Coopworth	94	35.56[a]	0.38	55.21[a]	0.46	4.43	0.08	75	15.85	0.39	1.37	0.25 (79.8)
Nutrition												
Low	76	35.75	0.42	47.41[a]	0.51	4.43	0.09	61	14.69[a]	0.44	1.40	0.28 (80.3)
Medium	62	37.08	0.46	57.70[b]	0.56	4.24	0.10	51	16.87[b]	0.48	1.53	0.33 (82.3)
High	68	35.96	0.45	63.81[c]	0.55	4.40	0.10	57	16.67[b]	0.45	1.65	0.32 (83.8)
Brd * Nut[1]												
Low * Rom	40	36.83[b]	0.59	48.63[b]	0.71							
Low * Coop	36	34.43[a]	0.61	45.92[a]	0.74							
Med * Rom	34	36.71[b]	0.61	57.10[c]	0.75							
Med * Coop	28	37.54[b]	0.70	58.43[c]	0.84							
High * Rom	38	36.85[b]	0.60	64.66[d]	0.73							
High * Coop	30	34.88[a]	0.69	62.77[d]	0.84							

[1] Breed by nutrition interaction
[2] Logit-transformed
[3] Back-transformed (%)

present results indicate that increasing hogget total live weight by more than 12 kg during pregnancy will not affect lamb birth weight or lamb survival. Shearing during mid-pregnancy increased lamb birth weight but in this study this was not associated with a significant increase in lamb survival. Further examination of mid-pregnancy shearing of hoggets under differing conditions may be warranted

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